CLAIMS

1.   A method for enhancing underwater imaging affected by image degradation effects,
the method comprising:

5   acquiring at least one image of an underwater scene using an imaging device;
        determining information regarding distances of parts of the scene relative to the imaging
                device; and
        reconstructing an image of the underwater scene using a physics-based mathematical model,
                compensating image characteristics influenced by distance-dependent underwater
10   degradation effects including veiling light, using the information on the distances of
                parts of the scene from the imaging device, and compensating distance-dependent
                underwater degradation effects relating to the distance of illumination sources from the
                scene.

15   2.   The method of claim 1, wherein the image characteristics comprise at least one of the
      characteristics group consisting of: contrast, color, sharpness, brightness.

3.   The method of claim 1, wherein compensating distance-dependent underwater
degradation effects relating to the distance of illumination sources from the scene comprises
20   compensating effects attributed to the underwater depth of the scene.

4.   The method of claim 3, wherein compensating effects attributed to the underwater
depth of the scene comprises white-balancing.

25   5.   The method of claim 1, wherein the physics-based mathematical model comprises an
inversion of an image-formation model including backscatter.

6.   The method of claim 5, wherein the invenrion includes regularization.

7.　　The method of claim 5, wherein the image-formation model that is inverted is approximated such that the approximation error is not discernible.

8.　　The method of claim 1, wherein acquiring of at least one image of the underwater scene comprises acquiring at least two images in different imaging settings.

9.　　The method of claim 8, wherein said at least two images are acquired in different resolution.

10.　　The method of claim 8, wherein acquiring at least two images in different imaging conditions comprises acquiring at least two images of the scene in different polarizing states of the imaging device.

11.　　The method of claim 1, wherein acquiring said at least two images comprises acquiring said at least two images simultaneously.

12.　　The method of claim 1, wherein the reconstructed image comprises three-dimensional rendering of the scene.

13.　　The method of claim 1, wherein the information regarding distances of parts of the scene relative to the imaging device is used to reconstruct a distance map of the scene.

14.　　The method of claim 1, wherein the imaging device comprises a camera.

15.　　The method of claim 1, wherein the imaging device comprises at least two cameras.

16.　　The method of claim 1, wherein determining of information regarding distances of parts of the scene relative to the imaging device comprises extracting the information from said at least one image.

17.   A system for enhancing underwater imaging affected by image degradation effects, the
system comprising:

an imaging device adapted to acquire at least one image of an underwater scene using an
          imaging device;

5   a processing unit for determining information regarding distances of parts of the scene
          relative to the imaging device and for reconstructing an image of the underwater scene
          using a physics-based mathematical model, compensating image characteristics
          influenced by distance-dependent underwater degradation effects including veiling
          light, using the information on the distances of parts of the scene from the imaging

10   device, and compensating distance-dependent underwater degradation effects relating
          to the distance of illumination sources from the scene.